DAKOTA ZEPHYR

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SPECIAL EDITION

SOIL CONSERVATION SERVICE

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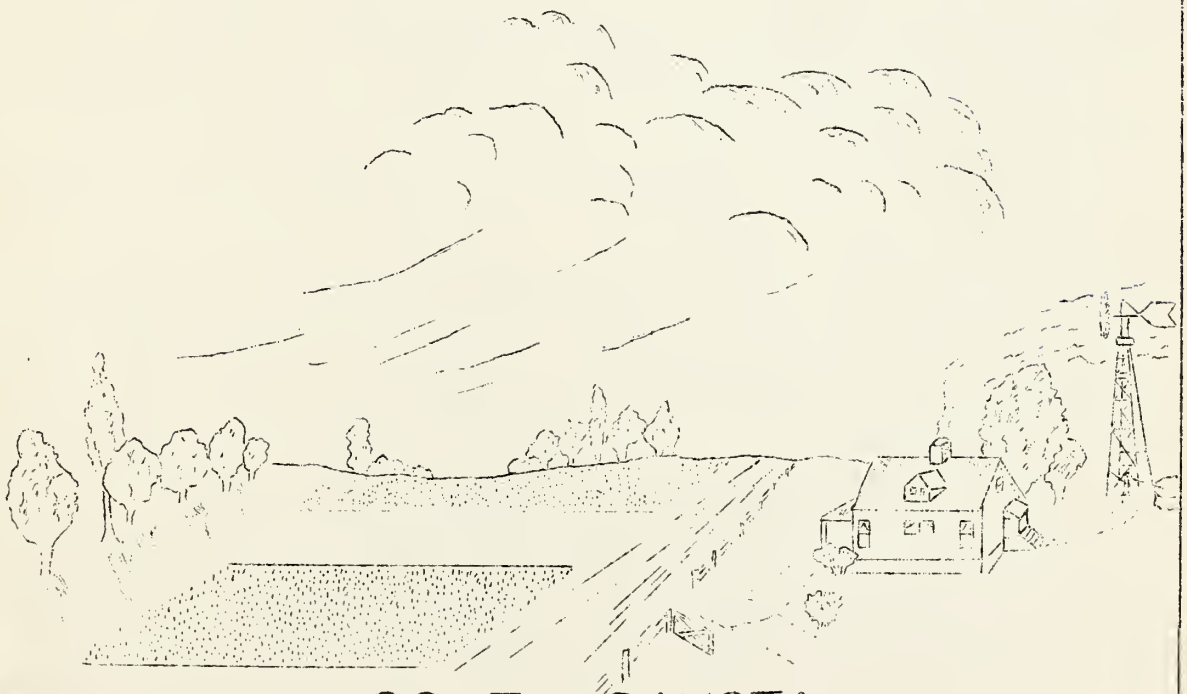

SOUTH DAKOTA

PROJECT NO. 1 HURON, S. D.
PROJECT NO. 2 WINNER, S. D.
REGION NO. 9

TITLE INDEX

THE DAKOTA ZEPHYR

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A. D. Ellison — State Coordinator

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We are devoting this issue of the Dakota Zephyr to suggestions and recommendations with special reference to erosion control practices. This material has been selected from previous editions of the Dakota Zephyr and from publications and articles with respect to erosion control, which have been prepared by Staff members of the Soil Conservation Service.

Farm Operators residing within designated erosion control areas, in cooperation with the Soil Conservation Service, have already made a creditable showing in demonstrating practical farm methods to control erosion. It is our desired hope that those who are interested in erosion control should avail themselves of the opportunity to visit the areas and to discuss the problems of erosion control with farmers who are practicing approved methods.

Everyone should be vitally concerned with the problems of erosion control--whether it be by water or wind. It is exceedingly difficult to economically produce crops on soils that have become impoverished by erosion. To many of us, the soil is our only heritage. It is the fundamental basis of industry. Yet, we are prone to neglect it, until it becomes a liability rather than remain an asset.

In order to acquaint our readers and those interested in methods of erosion control, we are presenting suggestions and practices which are fundamentally sound. Practically all of these methods and practices are being followed by cooperators in demonstration areas. There are also included a number of farm use plans that may prove helpful in arranging a strip-cropping system to help improve and to maintain our soil against the ravage of erosion.

It requires the hearty cooperation of all farmers in a windblown area or in an area subject to blowing, to accomplish the most favorable results. It still remains our individual responsibility to ourselves and to our community to endeavor to maintain and improve that which affords our livelihood. All practical methods of land utilization should be employed to help maintain or restore the farm to economic production and to prevent soil waste by erosion.

THE SOIL CONSERVATION SERVICE

IN SOUTH DAKOTA

H. J. Clemmer, Regional Conservator
Rapid City, South Dakota

The Soil Conservation Service ranks with the other bureaus in the United States Department of Agriculture. Its chief purpose is the demonstration of proved methods of soil erosion prevention and control. To accomplish this objective a total of 141 demonstration erosion control projects have been established in 41 states, covering a total area of 46,141,500 acres, 6,541,500 acres of which is privately owned land and 39,600,000 acres federal lands.

For the purpose of carrying out suitable erosion control programs and facilitating administrative procedure the United States has been divided into eleven regions. South Dakota, North Dakota, Montana, and Wyoming constitute Region 9. The regional office is centrally located at Rapid City, S. Dak., where business and technical staffs are employed. Demonstration projects are located in the four states, South Dakota having two projects and the other states one each.

The ranking soil conservation official in each state is the State Coordinator who, while a representative of the federal service, works in close cooperation with the agricultural college and experiment station in the state and through the action of the state advisory committee, consisting of the state coordinator, the director of the agricultural experiment station, and the director of extension service, assists in coordinating the efforts of all agencies, state and federal, into a complete and comprehensive soil conservation program.

All contacts by the Soil Conservation Service with state agencies are made through the state coordinator.

Each demonstration project is in charge of a project manager who in states having only one project is the state coordinator.

The activities of the Soil Conservation Service are limited to the project areas. On the privately owned lands, - such as those in South Dakota, all work is conducted in voluntary cooperation with the farm owners and operators within the boundaries of the authorized demonstration project. Before the cooperation between the farmer and the Service becomes effective an agreement is signed by the two cooperators--the farmer and the Service--in which the farmer agrees to carry on the agreed-upon program for five years. The farmer thus becomes a voluntary demonstrator showing to his neighbors the results obtained by following the program.

As a cooperator with the farmer the Soil Conservation Service furnishes definite plans and maps for carrying on the soil conservation work, usually making a detailed soil survey, erosion survey, and a social and economic survey of the farm before the program reaches its final form.

The program may involve terracing, dam construction, contour furrowing, narrow field farming (often called strip farming), change in farm plan and crop rotations, the establishing of permanent grass cover, the introduction of legumes on a large scale, planting of wind breaks, the use of special machinery to level soil drifts in fields, along fences and around buildings.

Where found necessary to carry out the program the Soil Conservation Service has used its mechanical equipment to assist in removing fence drifts and soil accumulations in fields, commonly called hummocks. In order to quiet the drifting soil, tractors and listers have been used to roughen the soil so that a vegetative covering may have time to grow.

Grass seeds, chiefly western wheatgrass, crested wheat grass, and brome grass, as well as sweet clover and alfalfa seed have been furnished to cooperators according to their particular farms. Trees and shrubs have also been furnished for the planting of wind breaks for erosion control purposes. The fact that W. P. A. labor has been available has made it possible to assist some cooperators in cleaning up old tree plantings and preparing new ones. Wildlife management also being included in the general program.

Terraces and dams have been constructed on the farms of some of the cooperators for the purpose of conserving water.

Farm record books have been prepared and distributed to cooperators desiring them, close cooperation being established with the county agents.

Voluntary Soil Conservation Associations have been organized in six communities where farmers are planning to carry on a program of soil conservation and erosion control.

The first demonstration project in South Dakota was approved for the Shue Creek and Wolsey areas situated in Beadle, Clark, and Spink Counties, January 15, 1935 and a project office was opened in Huron, S. Dak., February 15. The total area included in this project is 196,000 acres. The second South Dakota project, located in Tripp and Gregory counties, has an extent of 49,280 acres.

Adequate qualified technical personnel has been assembled to carry on the work on these projects as it is being planned.

In South Dakota three C. C. C. Camps have been operating under the direction of the Soil Conservation Service. These camps are located at Huron, Chamberlain and Alcester. The first two are concerned chiefly with water conservation. The Huron Camp since its establishment on the State Fair Grounds last fall has been engaged in the construction of a new dam across James River which will afford a greater reserve water supply, assist in flood control and furnish increased recreational facilities. The Huron Camp has furnished a detail of men stationed at a side camp at Presho to complete work on dams left incomplete when the Presho camp was moved last fall.

The Chamberlain Camp is located about 14 miles north of Chamberlain on Crow Creek where a large dam is being constructed.

The Alcester Camp is chiefly concerned in soil erosion control. In addition to the regular personnel of the camp staff a technical staff has been assigned to the camp by the Soil Conservation Service for the purpose of formulating plans for effective erosion control practices. At present 65 farmers in the Alcester area are cooperating on the basis of a five year agreement in the soil conservation program.

The progress of the soil conservation work in South Dakota to April 1, 1936 is recorded in the statistical statement on the following page.

* * * * * * * * *

"It is the first business of every farmer to reduce the fertility of the soil, by removing the largest crops of which the soil is capable; but ultimate failure results for the landowner unless provision is made for restoring and maintaining productiveness. Every landowner should adopt for his land a system of farming that is permanent, -- a system under which the land becomes better rather than poorer."

C. G. Hopkins - 1910

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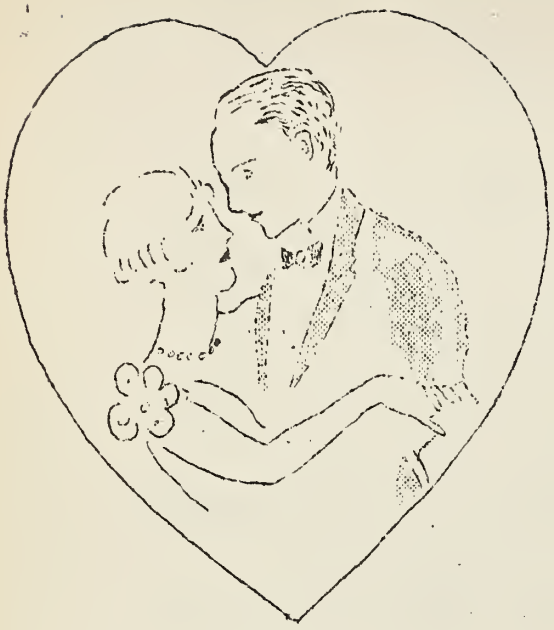
The oldest living thing on the earth, in so far as known, is a tree. The man who plants a tree and cares for it leaves a living monument and those who come after him enjoy its shade and shelter and bless him for his thoughtfulness.

REPORT OF THE WORK DONE BY CONSERVATION SERVICE IN SOUTH DAKOTA

ON THE WINNER-DIXON AND WOLSEY-SHUE CREEK AREAS.
Up to April 1, 1936

1.	Number of farms cooperating	219
2.	Number of acres in cooperating farms	56,051
3.	Number of applications pending	102
4.	Total acreage (pending applications)	33,207
5.	Number of acres upon which detailed soil survey has been made	83,360
6.	Number of acres upon which detailed erosion survey has been made (mapped)	65,210
7.	Number of farms upon which strip farming has been established and strips designated	219
8.	Number of farms planting trees for erosion control	95
9.	Number of farms cooperating in wildlife management	75
10.	Number of acres of alfalfa sown	3,775.7
11.	Number of acres of sweet clover sown	5,201.4
12.	Number of acres of grass sown (other than pasture)	2,543.8
13.	Number of acres in pastures reseeded	12,022.75
14.	Number of acres seeded to oats or rye for erosion control in 1935: Oats..	6,265
	Rye...	4,540
15.	Number of dams constructed	3
16.	Number of miles of terraces built	14.7
17.	Number of miles of fences cleaned	285
18.	Total number of WPA man-years employed	201.92
19.	Number of farm business records distributed	99



TAKE CARE OF THE SOIL
WHILE YOU ARE YOUNG

AND

THE SOIL WILL
TAKE CARE OF YOU
WHEN YOU ARE OLD

We are all young once, but in the course of human events we all grow old. Blessed are they who in their declining years own a productive farm to support them and to insure economic security for those who follow them. Save the soil.

J. G. H.

WHAT IS SOIL

Soil is the outermost part of the crust of the earth which consists of loose material derived from the natural breaking up of the rocks by the physical and chemical agencies of weathering. This material has been modified by the action of plants which have grown upon it and whose roots and bodies have become mixed with the rock material.

It takes thousands of years for a soil to develop upon the loose, fine-grained rock material, because at first the plants that can grow upon the raw rock material, are limited in their growth and the rate of accumulation of organic matter from the decaying plants is very slow. However, if time enough elapses during which the conditions are favorable for plant growth, partly decomposed organic matter will accumulate in the top soil and change its color to a darker hue. Where the accumulation goes on for thousands of years, the dark colored top layer may become several inches or even a foot or two in depth. This is the "top-soil" which contains most of the nitrogen accumulated from small amounts of nitrogen compounds coming down in the rain and from the action of bacteria in the soil and on the roots of legumes. Most of the chemical action which dissolves the mineral plant food for the use of plants goes on in this layer.

Since the top-soil is the part of the soil in which most of the feeding of growing plants goes on, it is easy to see that it must be preserved if crops are to grow. It is a fact that this layer of top-soil is the only defense humanity has against starvation and nakedness. It is also true that the subsoil underlying the top-soil does not possess the crop producing qualities of the top soil and could not change to top-soil except after centuries of action by top-soil-forming processes.

The top-soil varies in texture. It may be sand, sandy loam, loam, silt loam, clay loam, or clay, depending upon the sizes of the soil particles and the percentage of each size contained in the soil.

The subsoil may vary as to texture and structure, that is, the size and arrangment of the soil particles. Subsoils may range from gravel to clay and it is partly on the basis of the subsoil that soils are divided into groups and given names so that they may be described and studied. One of these soil groups is usually called a soil series and has the same kind of subsoil throughout the textural series of top-soils. In the soil survey reports, descriptions of these soil series are given in detail.

- J. G. H.

WHAT CAUSES SOIL DRIFTING?

The question is frequently asked as to why the drifting of soils is so much more common than it formerly was. Many people think that it is due entirely to the dry weather which has prevailed during the past few years and that when the rainfall becomes normal again soil drifting and dust storms will cease.

It is true that the drought has had a direct influence as well as indirect influences on the increase in the movement of the soil by the wind but it is not the chief cause.

Soil is made up of grains of mineral matter of various sizes varying from gravel to clay. Mixed with the mineral matter is a considerable amount of organic matter commonly called humus. This material consists of the remains of partly decomposed plants and is spread over the surface of the soil grains as a thin film. It is dark colored and so gives a dark color to the soil grains which themselves are generally gray in color. The surface or top soil in this part of the country is always darker in color than the subsoil which is usually gray or yellowish gray. The difference in color is largely due to the amount of humus contained. The top soil contains much humus while the subsoil contains very little.

The humus film around the soil grains has a slightly sticky nature and after being wet it shrinks and holds the soil particles together in the form of little lumps or granules. Sometimes these are large enough to be called clods. These granules are generally large enough to resist the movement by the wind.

Since the soils were first plowed a large part of the organic matter in the films has been consumed and the films are thinner than they were at first. The humus is less sticky than formerly and so when the soil is moistened and then dries again the single particles do not hold together but fall easily apart so that the wind is able to move them readily. In the sandier soils humus is the only sticky material holding the soil grains together, but in the heavier soils there is also some very fine clay which has a sticky nature, hence these soils generally remain granulated even after some of the humus is removed. This is the reason that the heavier soils are generally not blowing so badly as the lighter sandier soils although there are some places in which the granules of these heavier soils are small enough for the wind to blow or roll along the surface of the ground and form great drifts.

Investigations at the state experiment station show that as much as 29% of the humus of the soil may disappear in 21 years under the ordinary methods of farming. The state soil survey has found similar conditions existing in many parts of the state.

If the rainfall alone held the particles together all would be well but it has just been shown that the humus in the soil plays a large part in holding them and since the humus is much scarcer than formerly the soil granules have been broken down and will continue in this state even after the rain comes again. This condition will last until new organic matter has been returned to the soil and has had a chance to decay. For these reasons, it may be seen that more care must be taken with the soils which are blowing or are beginning to blow than was formerly necessary.

The soils were formerly protected by a covering of vegetation which served to keep them covered and also to provide much root material in the soil which holds it together. The breaking of the sod destroyed this cover and the general methods of farming have not maintained a cover on the soil except for a portion of the year. Fall plowing and summer fallowing have helped to destroy the vegetative cover which might have developed from weeds and other wild vegetation. Grasshoppers and severe drought have been important factors in destroying native and cultivated cover crops.

Burning the stubble, stalks, and straw which was formerly generally practiced has prevented the return of organic matter to the soil and has hastened the rate at which humus has disappeared. All of these things taken together have resulted in great changes in the soil itself. These things must all be taken into consideration in planning for wind erosion.

J. G. H.

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I N V E S T M E N T

"If the art of agriculture has ruined the land, the science of agriculture must restore it; and the restoration must begin while some farmers are still prosperous, for poverty-stricken people are at once helpless and soon ignorant. Outside help will always be required to redeem impoverished soils, for poverty makes no investments, and some initial investment is always required for soil improvement."

Cyril G. Hopkins, 1910.

WHAT IS SOIL EROSION?

Soil erosion is simply the removal of soil from land by the action of the wind or running water.

WIND EROSION

Wind moves the soil in two ways:

1. It carries the finer particles entirely away in the form of fine dust which rises high into the atmosphere and shuts out the light of the sun. This dust is usually the more fertile part of the soil.

2. The coarser particles of the soil are too heavy to be carried bodily by the wind and are rolled along the earth's surface forming drifts where the wind encounters obstructions. These accumulations of soil form the spectacular drifts burying fences, machinery, buildings, trees, and crops. This is usually the less fertile part of the soil.

Where soil is showing any tendency to blow or drift, even under the highest wind velocities, definite precautions should be taken at once to keep the soil covered with crop throughout the year and the soil should be roughened at right angles to the strongest winds while the crops are getting started.

Soil blowing is just as great a menance as a prairie fire and should be controlled just as promptly. All other work on the farm should be stopped, if necessary, when the soil begins to move and every effort should be made to stop the soil movement. An early recognition of this fact will save many grain fields.

To keep bare soil from blowing it must be kept rough. It must be kept rough until a crop cover can be established.

WATER EROSION

Water moves the soil by carrying it along as it flows. The movement occurs in two ways:

1. By the formation of gullies, or ravines, in the soil which cut up the fields so that they cannot be farmed and in the long run through their growth in length, width, and depth remove all the soil and the subsoil.

2. By sheet erosion. This is the removal of the soil in sheets without the formation of gullies. Sheet erosion may proceed almost unnoticed until the top soil becomes so thin that crops can grow but poorly or perhaps not at all.

If there is any sloping land in your vicinity it will pay you to observe what is happening on the sloping fields. If you find soil washing down into the lower places you may know that an insidious soil disease is already setting in, namely, soil consumption or soil ruin by the actual removal of the soil itself from the slopes, where it is needed, to the low places where it is not needed and where it actually does damage.

If you will observe closely you will see that drilling grain or planting and cultivating corn up and down the slopes hastens greatly the soil removal process.

We are so accustomed to farming parallel with the section lines that it is difficult to think of farming in any other direction, but much can be done to prevent erosion by water by seeding across the slopes instead of up and down the slopes.

Soil erosion surveys covering the entire state show that there are large areas in which soil erosion is a serious problem. In the loessial soil area in the southeastern part of the state there are many farms suffering from gully formation and sheet erosion as are those outside the loessial area along tributaries of the Missouri River. Wind erosion is much more general and over large areas in a number of counties much damage to soils has occurred.

It should be stated that there are large areas of soil in the state where no serious damage to the soils by the wind or water has occurred. For this reason, it is often difficult for people living in such localities to appreciate the fact that much good land has been and is being ruined by erosion. The fact remains, however, that while ma ny eroded farms are still in operation the yields are decreasing and that there are too many sets of good farm buildings standing vacant on farms from which much of the fertile top soil has been removed.

J. G. H.

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The future prosperity of any nation depends upon the productivity of its soil. Loss of soil fertility is the loss of a resource which cannot be readily regained.

DO SOILS WEAR OUT?

Of course you have often noticed that a farm on one side of the road may be a money maker while the farm on the other side may be a distinct liability. And if you took the trouble to inquire you probably found that years ago both of these farms were equally good. Then did you ever wonder just why one farm should keep good and the other go bad? The explanation is very simple, in fact it is just about as simple as explaining a bank account.

You have a bank credit that represents a reserve of just so much money. In a similar manner every farm represents a reserve of a fairly definite amount of plant food. Everytime you draw on your bank account it is depleted just that much and everytime a crop is removed from the soil the plant food reserve is lowered. Naturally the lower the reserve the less able are depleted soils to produce crops.

It is natural therefore that the farmer who does those little things like rotate crops, use manures, etc., things that tend to maintain the productive capacity of the soil, should maintain or build up a plant food reserve that will make him money year after year.

On the other hand, it is also natural that the man who does nothing but take off cash crops, should get less and less because he continues to deplete his reserve. He continually takes away and returns nothing. His soil gradually produces less and less, its reserve gets lower and lower, it gradually wears out. But the tragedy is that as it gets less productive it tends to become more subject to water and wind erosion. It wears faster and faster until finally the fertile top soil is going or gone. And then -- when that time arrives -- and it has arrived on many farms -- financial difficulties or worse are the rule.

Yes, soils wear out -- wreck themselves and their owners -- or they do not wear out and make money for their owners -- according to the way the reserve (the credit of plant food) is manipulated.

P. E.

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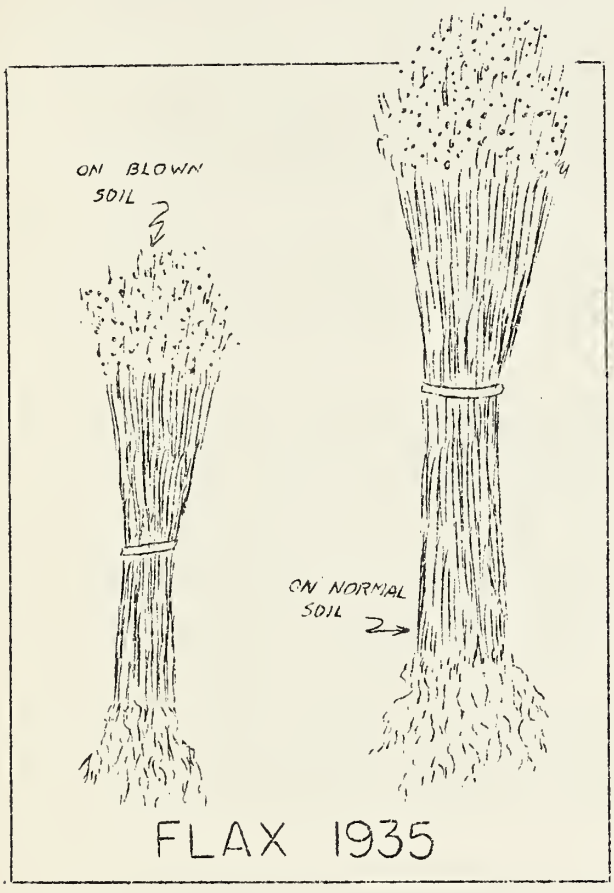
Crop production depends on soil fertility and continued losses of top soil are steps toward bankruptcy.

ROBBERY !

WIND EROSION STEALS PLANT FOOD



Soils which have been subjected to severe wind erosion frequently show the result of the removal of the fertile top soil in decreased crop yields. The sketch of two bundles of flax shown here were traced from an actual photograph of flax grown in Beadle County. The short bundle on the left grew on a part of the field from which some of the surface soil has been removed, while the larger bundle grew where the soil has not been blown. Similar observations may be made in grain fields and corn fields.

Occasionally, good crops are reported from fields which have been eroded. There are many examples of fields which last spring appeared to the casual observer to be ruined which have produced fair crops last summer. Careful examination shows that even though the soil may have been bare in 1934, no notable soil removal occurred.

In a recent issue of the "Zephyr", Paul Emerson, Chief Soils Specialist, called attention to the fact that the nitrogen alone in the surface six inches of soil over an acre in this area is worth $400.00 if purchased on the market as commercial fertilizer. Nitrogen is one of the essential elements of plant food and is found chiefly in the dark layer of surface soil so that when the surface soil is removed the nitrogen goes with it and the crop yield is reduced as shown in the sketch. When all surface soil is removed, there will be little or no crop.

Sweet clover has the power of taking nitrogen from the air and can be grown on blown soils. If it is plowed under, the nitrogen supply will be gradually increased and blown soils may again become productive.

- J. G. H.

VEGETATIVE METHODS OF EROSION CONTROL

As our fight against soil erosion advances, we may learn a valuable lesson from Mother Nature, who controlled erosion for centuries before man destroyed her stabilizing cover of vegetation.

Throughout countless ages this wise old lady clothed the slopes and plains with soil-holding plants--trees, shrubs, and grasses. Only when man comes upon the scene to clear and cultivate unsuitable lands does erosion speed up to a destructive rate.

Vegetation works in a variety of ways to control erosion. The interlacing of the plant roots in the ground binds the small soil particles together and holds them in place as carefully as stitched thread secures our garments.

Any effective method of erosion control of necessity involves proper land use. Expressed differently, this means planting each acre or field to the crop for which it is best suited.

Economic conditions frequently necessitate variation from the ideal, but insofar as possible, the farmer should cover sloping land and wind-blown areas with close growing crops just as much of the time as he can, leaving the bare surfaces exposed only when such a practice cannot be avoided. This is fundamental in any effective program or plan for erosion control. It is well to adopt in the beginning of this fight against erosion a system of permanent agriculture, rather than to exploit the land at the expense of posterity. In other words, why tear down where we should be building up?

A vegetative program of erosion control must be adapted to local conditions. It should include the use of close-growing crops such as grass, clover, various legumes, adapted to the climate and soil, and also for which there is economic need. While it is entirely possible to reduce erosion to a minimum by use of vegetative methods alone, it is not always economically practicable to do so. For instance if all blowing and washing land was returned to grass, the erosion problem would be eliminated. Such a policy is economically unsound.

Carefully controlled experiments conducted in all parts of the country prove conclusively that a vegetative covering greatly reduces the amount of surface run-off, and what is of even more importance -- the amount of soil removed by either wind or water.

At the Soil Erosion Experiment Station at Zanesville, Ohio, it was found that surface run-off was five times as much and the soil loss one hundred seventy-eight times greater where corn was grown two years in succession than where the ground was covered with blue grass sod. Similar results have been obtained wherever such studies have been made, and these exact measurements of comparative rates of soil and water losses prove conclusively the efficiency of close growing crops in keeping soil and water on the farm, thereby enabling the farmer to maintain yields.

As previously stated, it is not always possible because of economic conditions to make maximum use of vegetative methods of control. Where such is the case it becomes necessary to resort to specialized methods, among which may be mentioned terracing, contour tillage, rotation and strip cropping. Terracing and contour tillage may be considered as mechanical devices that are most effective when used in combination with vegetative methods of control, particularly on highly erodible soils.

A definite, carefully planned rotation is one of the safest and most economical ways of insuring the continuance of high production and of controlling the erosion forces. A complete rotation is one that includes the planting of legumes or other permanent hay or pasture crops and is followed by cultivated and drilled crops, then returned to the forage plantings again. Such a rotation furnishes a means of building up the fertility of the soil, of controlling weeds and furnishing sufficient organic reserves which act as a check to the tearing away of the soil by erosion.

Strip cropping which is a comparatively new practice in many parts of this country, is simply the systematic intermixing of close-growing and cultivated crops. Maximum protection is furnished without reducing the acreage of cash crops below the economic limit.

Finally, any effective erosion control program must make use of all possible methods brought together in one coordinated plan. This means trees should be planted on certain areas, certain areas devoted to pasture, and a combination of methods embracing proper crop rotations, strip cropping, contour tillage, and proper crop management.

The Soil Conservation Service of the United States Department of Agriculture, in certain project demonstration areas in this state is putting into effect such a coordinated plan of erosion control where all methods are being used.

W. C., Jr.

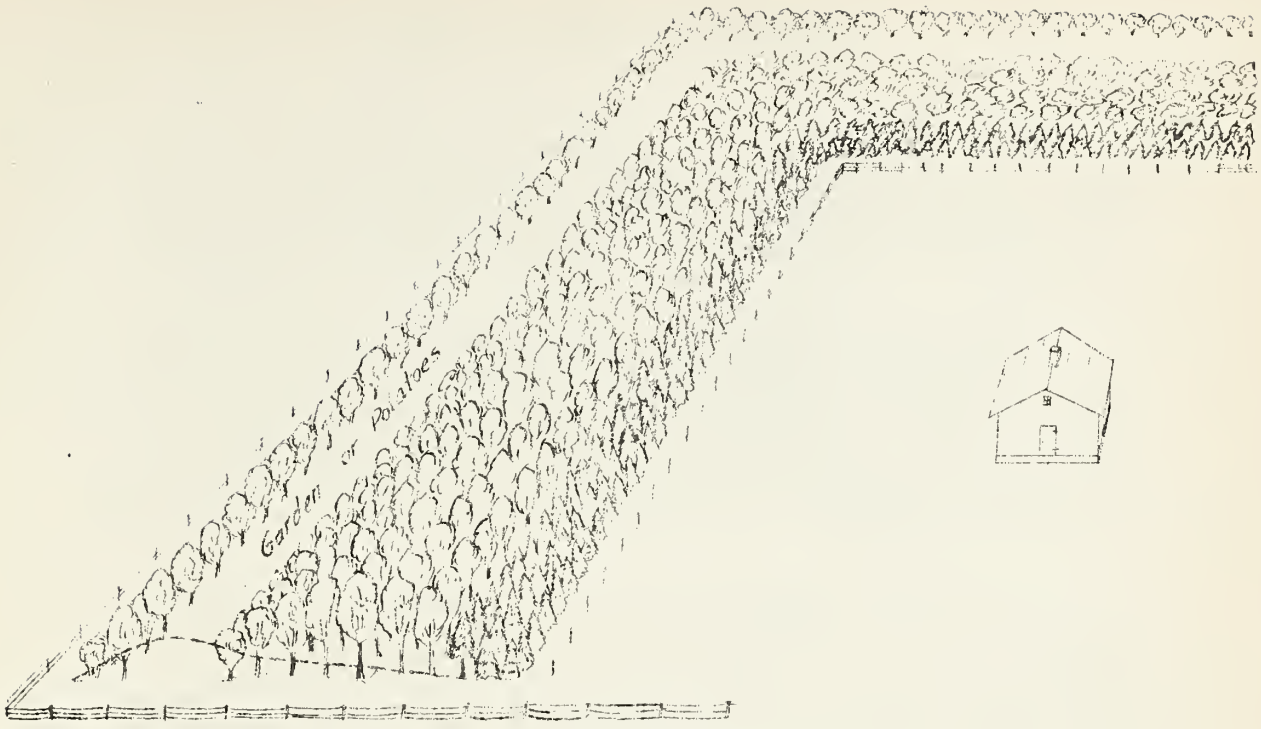
WIND EROSION AND TREE PLANTING

Water and wind are the two great erosion forces that are constantly at work. South Dakota, as a state, does not have a serious water erosion problem. Our greatest concern is the conservation of what water the land receives in the form of precipitation, rain and snow. We must hold it in place until it penetrates into the root zone, and the sub-surface layers later to supply the soil moisture our crop-producing plants demand. We build check dams across our gullies, construct terraces across our fields and contour furrow our pastures, all for one and the same purpose, to slow up the surface run-off of water. We actually make water "walk", from check dam to check dam, in the terrace or contour channel from end to end, until the largest absorption possible has taken place. We might conserve every drop of water and so control its velocity that very little soil is washed away, and still have done little to master the greatest erosion enemy the state has to deal with; Wind.

The enormous forces of the wind are always ready to whip up any unprotected soil surface and move it into the next field, or high into the air, and possibly into another state. What are the wind check dams that can be built? From the time of first civilization the answer has always been the same. Trees. Trees, planted in strips on the windward side of fields, retard the wind's pace, they not only help to prevent the soil from drifting, but exert their greatest influence in building up and conserving the soil moisture. Trees, when planted in this manner, so reduce the evaporation of soil moisture and so greatly lessen the transpiration of moisture from plants, that crops readily respond with a considerable increase in yield. We have many instances in this country that forcibly support this statement.

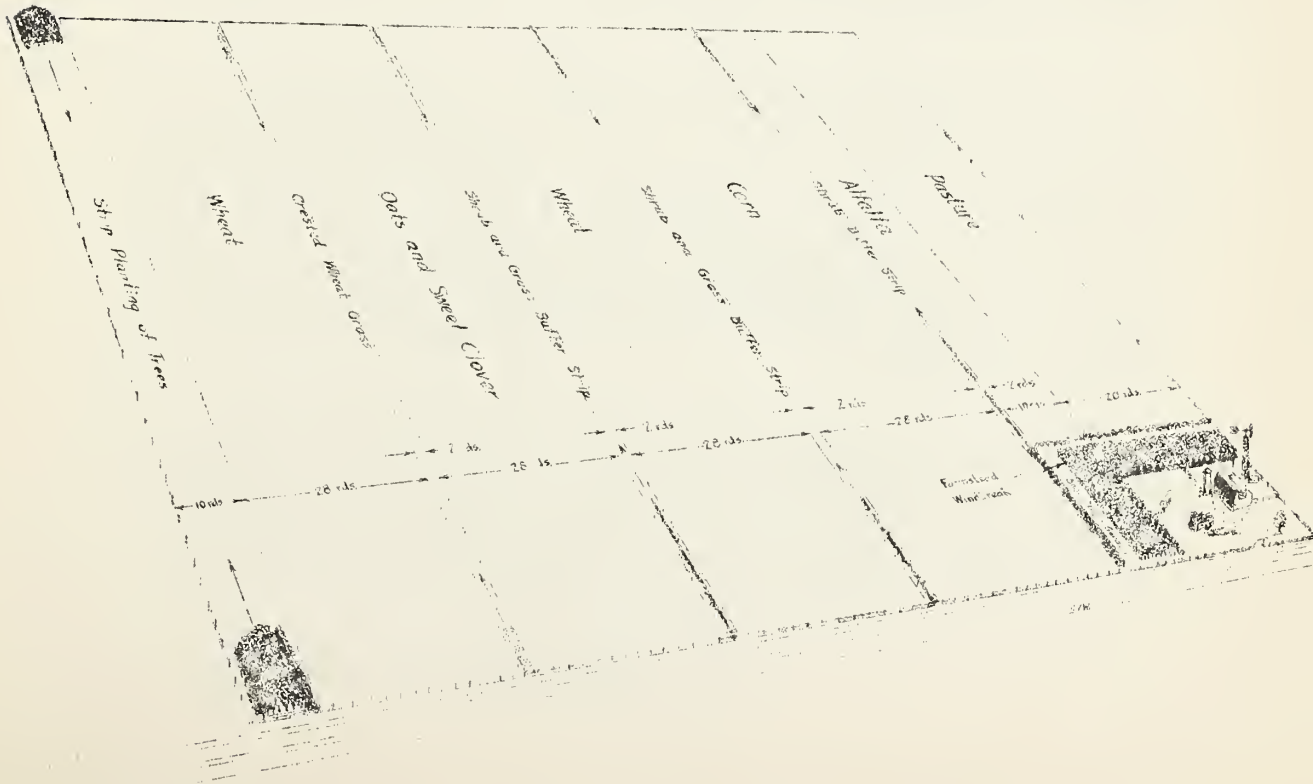
The greatest protection from tree plantings can be expected when the tree strips are spaced at intervals of about one-fourth to one-third miles. This procedure does not always fit our farming practices. The tree plantings must usually be spaced at greater distances. The sketch on the opposite page illustrates a combination tree and shrub hedge planting which, when judicially used, will give the maximum protection and the least interference with farm crops, providing the shrub buffer strips are located on the field boundary as indicated. Plantings of this nature are being used on a large scale in Canada. This sketch illustrates fields, tree and shrub hedges running in a north and south direction which is appliable to certain parts of South Dakota. A large area in South Dakota will no doubt be better protected by planting in an east-west direction as is generally recommended.

R. A. W.



Farmstead Windbreak

(Dotted line indicates accumulation of snow)



TILLAGE AND EROSION CONTROL

"When the soil is bare any kind of tillage, which will roughen the surface, gives a temporary protection from erosion. Two general objectives may be set up in considering this phase of erosion prevention, namely: ridging or clodding the surface soil and raising heavy sub-soil material to the surface.

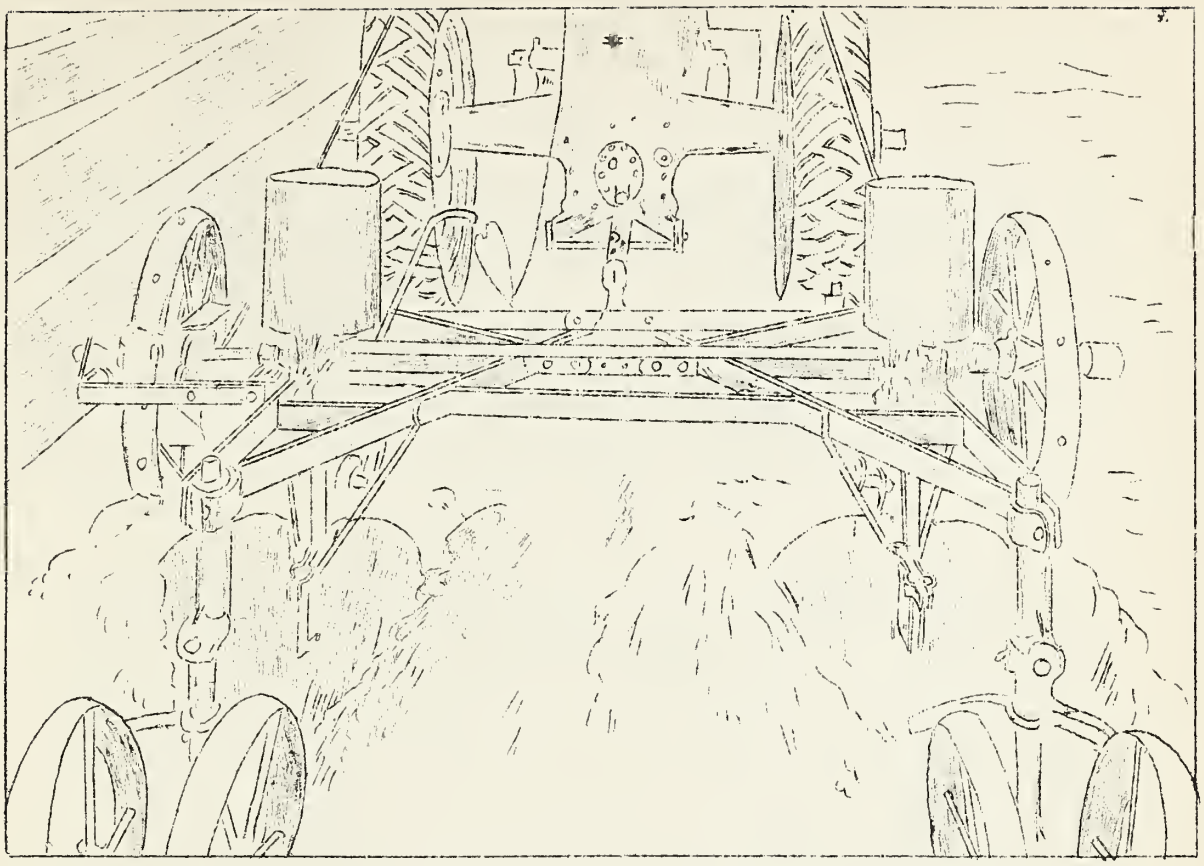
"Among the implements which have been used for the first mentioned purpose are lister, shovel or sweep cultivator, the one-way disc with each second or third disc left on, the deep furrow drill, the spike tooth harrow, plow and pocket digger. Implements which have been used for the latter named purpose are the chisel, sub-soil plow, moldboard plow, lister, the disc plow, and grading machine.

"The clodding effect of shallow tillage, especially on sandy loam soil, can often be increased by doing the job while the soil is wet. The object of raising heavier soil material from the sub-surface is to produce a more cloddy structure where the surface soil has become shifty. Operations of this character, though costly, may under certain conditions do permanent good, but they should be considered more as a temporary substitute for the desired vegetative cover. Organic matter in the surface soil serves the same purpose and possesses, also, certain other advantages to costing less. The most important advantages of vegetative control, as compared to mechanical control, are that vegetative covering renewed once a year gives more lasting protection and that it is important from the standpoint of maintaining soil fertility and keeping up the rate of moisture absorption to a high point.

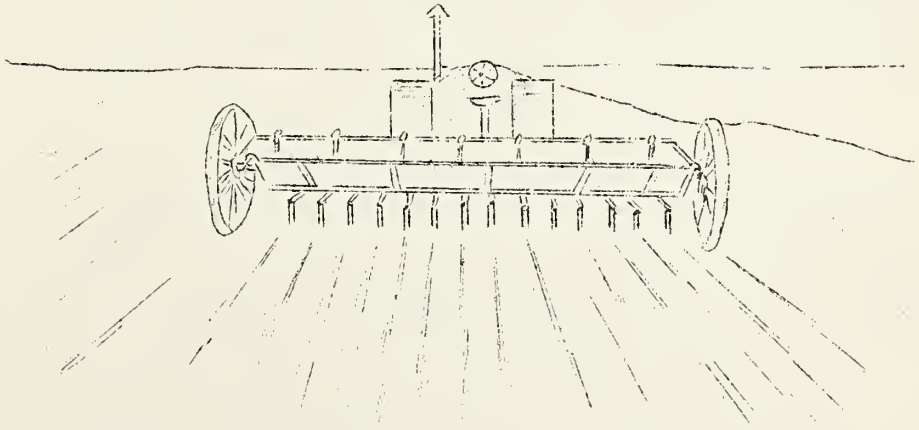
"Tillage methods at best afford only temporary relief and must be repeated at intervals during the season, all of which is done at an expense which is usually unproductive. In no case should tillage operations for erosion control be continued after an opportunity arises to start either a regular crop or an emergency cover crop. It is not intended to minimize the importance of soil mechanics but to point out the waste of relying unnecessarily on such methods. They should be used dilligently when all other methods have failed, serving as a fourth line of defense against wind erosion.

"Where erosion prevention tillage can be combined with necessary soil preparation or moisture saving practices the usefulness of the operation is much increased. In this connection it is needless to say that any tillage operations of soil requiring contour treatment should for the best moisture utilization, always be carried out on the contour."

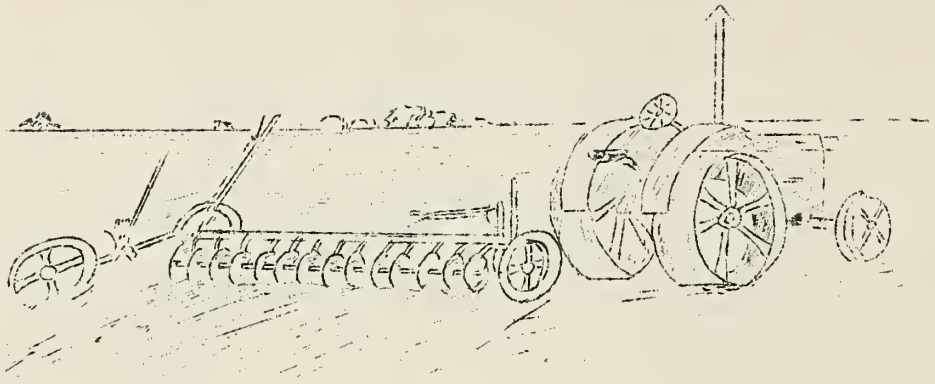
Quoted from Article by H. H. Finnell,
Regional Conservator, Region #6



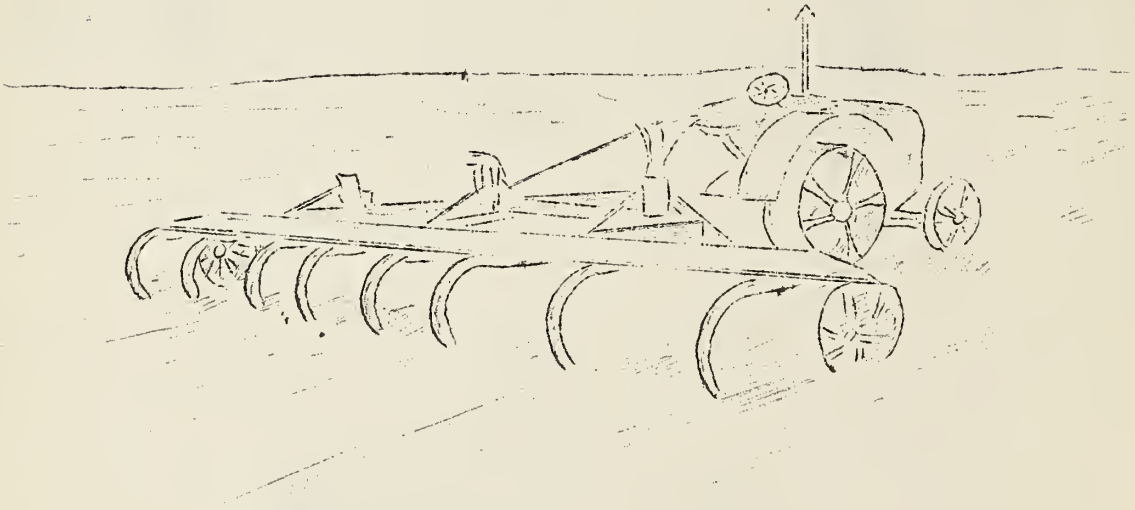
Lister



Duck Foot



One-way Disc Plow



Rod Weeder

"PLOWLESS SUMMER FALLOW AS A SOIL DRIFTING CONTROL MEASURE"

(Experiment Farm Note). The following article by W. S. Chepil, Experimental Sub-station, Regina Saskatchewan, is so applicable to sections of South Dakota that it is reproduced here.

"In areas of relatively low precipitation large acreages of summer fallow are necessary in order to conserve a sufficient amount of moisture for the profitable production of crops. Such large areas of summer fallow, however, provide favorable conditions for soil drifting unless proper precautions are taken to control it.

"Over large areas of the prairies in Western Canada a plowless summer fallow has in recent years rapidly increased in favor. Possibly one of the most important reasons for its increase in popularity is its relative cheapness over a plowed fallow, consistent with effective weed control for moisture conservation. When properly managed it has also been found to be quite effective as a measure against soil drifting. Used in conjunction with strip farming a plowless summer fallow has solved the soil drifting problem in the Monarch and the adjacent districts in Southern Alberta. Not only has its value been recognized in that area but it has also gained considerable popularity in other sections of the prairies.

"Recent investigations have shown that the value of a plowless fallow to control soil drifting depends on several factors which should not be overlooked. The most important of these is to conduct tillage in such a way as to leave the unbroken stubble at the surface of the ground for protection against the wind. This could be achieved by the use of the proper type of tillage implements and the minimum of tillage operations to give effective weed control. The presence of a heavy stubble is also desirable.

"The duckfoot cultivator, if it can be made to work satisfactorily, is most desirable for the first tillage operation on the land that is to be summer fallowed. Many of the present types of cultivators, however, can hardly be expected to handle stubble unless greater clearance is given between the shovels to prevent clogging. The cultivator shovels should also be placed below the crowns of the stubble for the first tillage operation. This will prevent excessive breaking of stubble and excessive pulverization of the surface. On very heavy stubble it may be necessary to use the one-way disc once, followed by a duckfoot cultivator or a rod weeder later in the season to kill weeds. The plowless fallow should be conducted with the minimum number of tillage operations possible consistent with effective weed control. Whatever imple-

ment is used, therefore, it should thoroughly eradicate the weeds at one operation. It is also necessary to begin tillage early in the season before weeds become too large. In the majority of cases, two or four tillage operations should be sufficient in any one season, provided perennial weeds are not a problem.

"Whatever implement is used great care should be taken to prevent excessive pulverization of the surface. Repeated use of a disc on a plowless fallow should be avoided for that reason. The rod weeder, when used excessively, and at shallow depth, may also produce the same effect. It is necessary, therefore, that the duckfoot cultivator should follow the rod weeder or a disc harrow as the last tillage operation in the fall. Where only annual weeds are present tillage towards the end of September or later should be avoided."

* * * * * * * * *

Dr. W. C. Lowdermilk, Associate Chief of the Soil Conservation Service, has this to say about soil erosion: "It is a disease which has followed mankind throughout the centuries in his exploitations and destructive treatment of the good earth from which he received his sustenance -- a disease, difficult to discern at first and responsive to treatment in the early stages, but absolutely fatal to civilization in the later stages."

Our land areas are enormous in extent, but good lands suitable for crops are estimated at only 461,000,000 acres. Since 51,000,000 are essentially totally destroyed for crop production by soil erosion and 125,000,000 acres more have lost most of their top soil, the problem for the maintenance of our present standards of civilization must be faced as a National problem of first importance.

* * * * * * * * *

Soil conservation is not something that can be accomplished in a year or two and then be forgotten. Soil conservation must go on as long as people eat and wear clothing. The various soil conservation projects are demonstrating how the work can be done on the farm -- the only place, after all, where soil is ruined or preserved.

J. G. H.

* * * * * * * * *

"The longest journey begins with a single step." -- Chinese Proverb

TYPES OF STRIP FARMING USED IN MONTANA

Ordinarily the Soil Conservation Service has used the term "strip cropping" to mean the production of crops in long strips, varying in width, placed crosswise to the slope, and approximately on the contour. The term "contour" implies a line passing through points of equal elevation. The term "field stripping" has also been used extensively by the Soil Conservation Service to apply to straight parallel strips laid out crosswise of the general slope.

Both strip cropping and field stripping as defined have been used in the more humid areas where water erosion presents the chief threat to the preservation of the top soil.

On the eastern slope of the Rockies, otherwise known as the Great Plains area, a relatively dry climate prevails and wind erosion is the big problem in soil conservation. For the control of wind erosion, a new term, "strip farming," originating in Canada, is used to designate straight parallel strips laid out crosswise to the prevailing wind direction. This term is used throughout the State of Montana.

Since the prevailing wind direction on the Power-Dutton project is westerly veering slightly to the south, the strips are planned to run in a north-south direction. In South Dakota strips running east and west are probably most effective. Wherever convenient it is advisable to run the strips in a north-south direction. Such stripping will more nearly meet the devastating winds at right angles. One farmer on the Power area has already stripped his land in this direction paralleling the U. S. Highway No. 91 which borders his farm on the west. This plan is excellent.

Strip farming, or stripping crosswise to the prevailing wind, does not solve the problem on all farms. On north-south slopes greater than 10% to 12%, the control of water erosion on the fallow strips must be considered.

Such a situation as described above has been encountered. The stripping has been laid out as illustrated in Figure No. 1. The strips have been narrowed to 16 rods and run crosswise to the north slope as well as crosswise to the prevailing wind direction on the west side. This plan has the advantage of controlling erosion by both wind and water and also increasing the length of the strips.

Another quarter section has a very steep slope to the northeast -- so steep in fact that it is nearly impossible to pull farm machinery up the slope. Severe sheet erosion has taken place.

It is hoped to plan the farm so that the strips will follow the contour approximately and to grass the strip taking in the steepest part of the slope as illustrated in Figure No. 2. This plan will take care of both wind and water erosion in an excellent manner and will make for much easier farming since all operations will follow the approximate contour.

In all planning efficient use of power machinery has been kept in mind.

Figure I

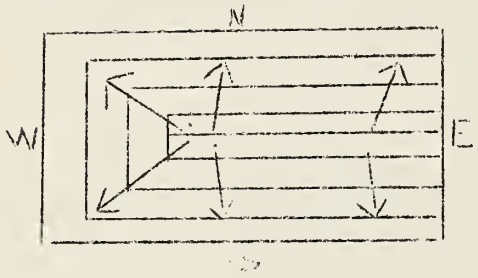
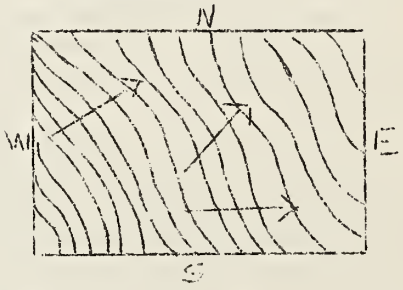


Figure II



From an article by O. Leon Anderson
Assistant Conservationist, Great Falls

* * * * * * * * *

HAS IT EVER OCCURRED TO YOU?

1. That the surface layer of the soil is the richest and most valuable part of the land?
2. That each acre of surface soil to a depth of six inches contains over 4,000 pounds of nitrogen?
3. That this plant food element when bought in the open market as fertilizer would cost over $400 per acre?
4. That many of our lands have lost from two to twelve inches of surface soil due to the blowing of the wind?
   This means that we have actually allowed the wind to blow away plant food to the value of from $35 to $800 per acre.

P. E.

SWEET CLOVER

Sweet clover is particularly well suited for pasture and for soil improvement. Seeded in established or new pastures, it has been found very beneficial in other respects besides its value as a pasture. Its ramifying roots open up the soil and subsoil, thus improving the conditions for the percolation of water and the circulation of air in the soil, and preventing a sod-bound condition of the grass roots. Sweet clover is a legume and by the aid of nitrogen fixing bacteria growing on its roots nitrogen from the air is added to the soil for the use of other pasture plants.

It is necessary that sweet clover be sown on a well firmed seed bed. The seed is small and therefore must not be covered too deeply. A firm soil is necessary in order that the soil moisture may come into close contact with the seed.

Sweet clover should not be pastured heavily during the fall of the first year. It is during this time that the young plants are storing a food supply in the roots in order to maintain themselves over winter and to start growth the next spring. Heavy pasturing in the fall interferes with this process and greatly increases the hazard of winter killing.

The use of good quality scarified seed of sweet clover makes it possible to sow at a lower rate than has heretofore been the practice. Seeding at a higher rate than sufficient to produce a stand under favorable years will not enhance the likelihood of producing a stand under less adverse conditions. If instead of seeding sweet clover at a high rate of seeding and sowing at infrequent intervals the same amount of seed be divided into two or three portions and sown in consecutive years, the chance of securing a stand would be greatly increased over a period of years by this method with no additional cost of seed.

In planning a rotation it is suggested that at least a quarter of the farm be sown to sweet clover with a nurse crop of small grain at a rate of not over four pounds per acre. Whether a stand is secured or not, need not interfere with the cropping system to be practiced the following year if summer fallowed or seeded to corn. Sweet clover must be allowed to produce some growth the second year, or else there may be some danger of it persisting. A growth of six to eight inches will be attained before it is necessary to plow for corn or else a hay crop may be harvested before summer fallowing. It is important that the hay crop be cut before any sign of blossom buds appear.

By sowing sweet clover and small grain each year on that portion of the farm which is to be summer fallowed or sown to a row crop the following year a long time system of soil improvement can be had without the necessity of taking land out of production. With a summer fallow system a good quality legume hay is produced.

S. C. M.

LAND USE PLANS

The following pages will give several examples of land utilization with field plans and rotation suggestions which provide good farm management practices in maintaining and improving the fertility of our soil, and in controlling erosion.

An attempt has been made in laying out these farm plans to make as little change in the general farm program as possible, as originally developed by the man actually living on the land and operating it. Attention has been given to the principles of providing the highest possible return each year, to maintain the fertility of the soil for the years to come and to control soil erosion.

Methods for the prevention of soil drifting consist, on the whole, of common agricultural practices which can be carried on by any farmer without expense to him or necessitating any drastic changes in his farm set-up. This agricultural program consists of the following suggestions:

1. Strip Cropping. This consists of breaking up large single crop fields into field strips about twenty to thirty rods wide, laid out at right angles to the prevailing wind direction. These fields to be cropped by using a system of alternating row crops, small grains and other close growing crops.

2. Use of a good rotation which would include a legume or grass crop at regular intervals to add organic matter and fertility to the soil.

3. Keeping cover on the land as much of the time as possible; that is, not allowing any large area of unprotected land to be exposed to wind action.

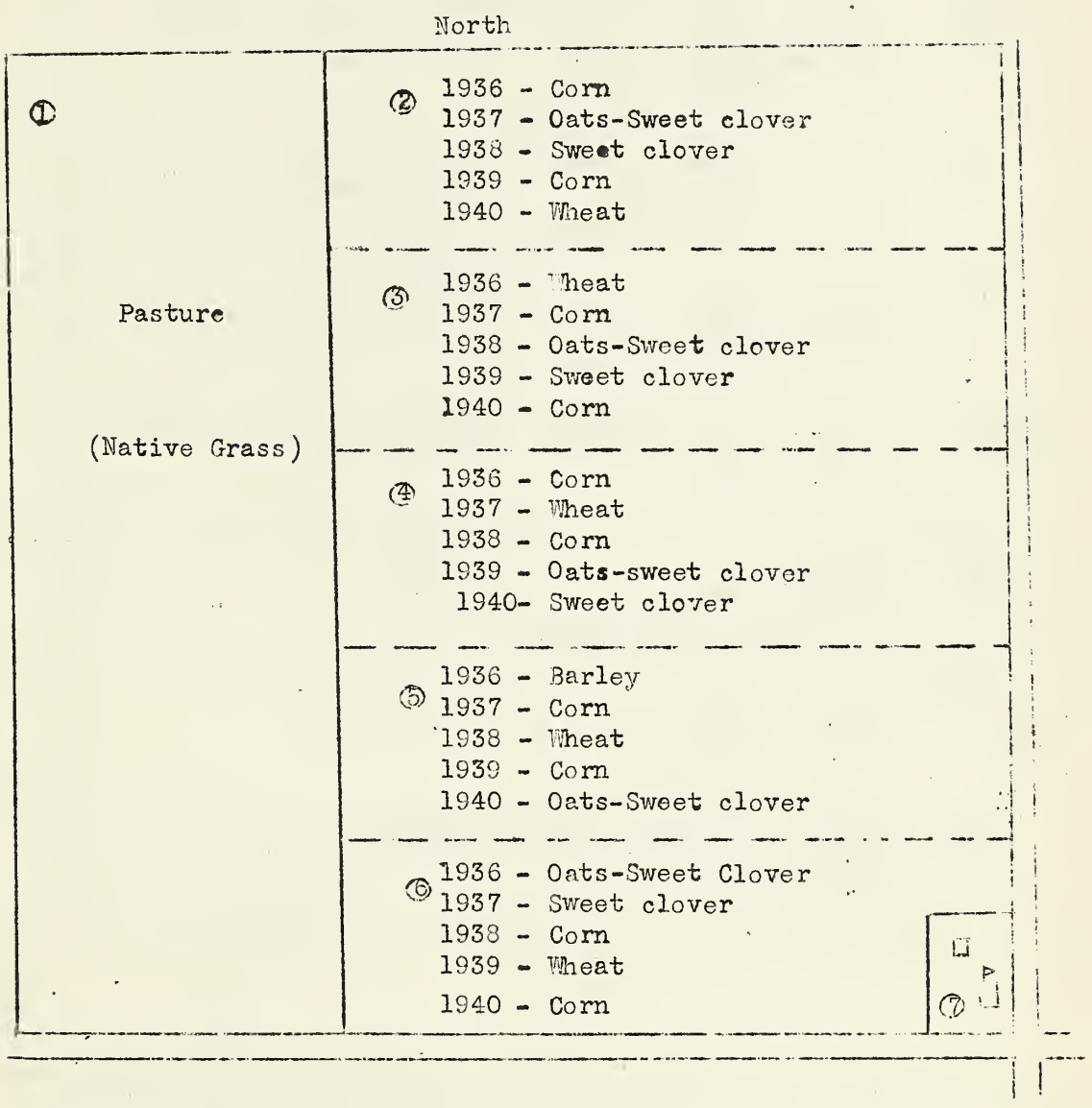
4. Keeping the surface of the soil in as cloddy a condition as possible without causing damage to seed germination. This means avoiding pulverizing the soil which would subject it to soil blowing.

5. Incorperating into the soil all crop residues including stubble, stalks and weeds. These should not be burned as has often been the practice, but should be worked into the soil in such a manner that this residue remains as close to the surface as possible.

6. General use of alfalfa, sweet clover, and native grass, especially on severely eroded fields.

PLANNED FARM

No. 1



Planned on a base of 160 acres of which 50 acres are in native grass, leaving a cropping base of approximately 104 acres.

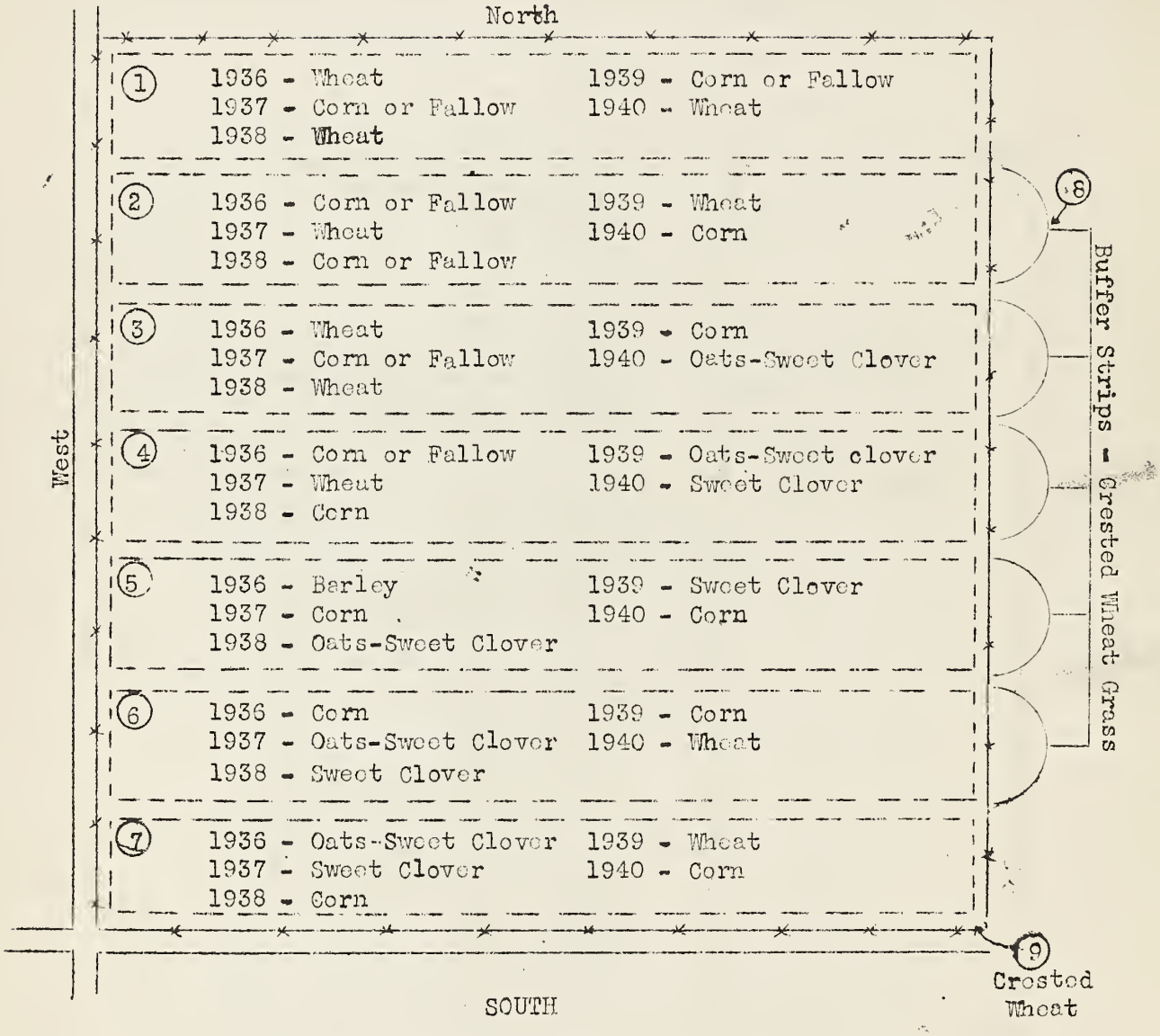
The 1936 cash or grain crops will be 84 acres.

The 1936 Soil improving crops will be 20 acres.

By studying this five year rotation, a very strong soil erosion control and improving program will be noted with substantial cash and feed crops each year.

PLANNED FARM

No. 2



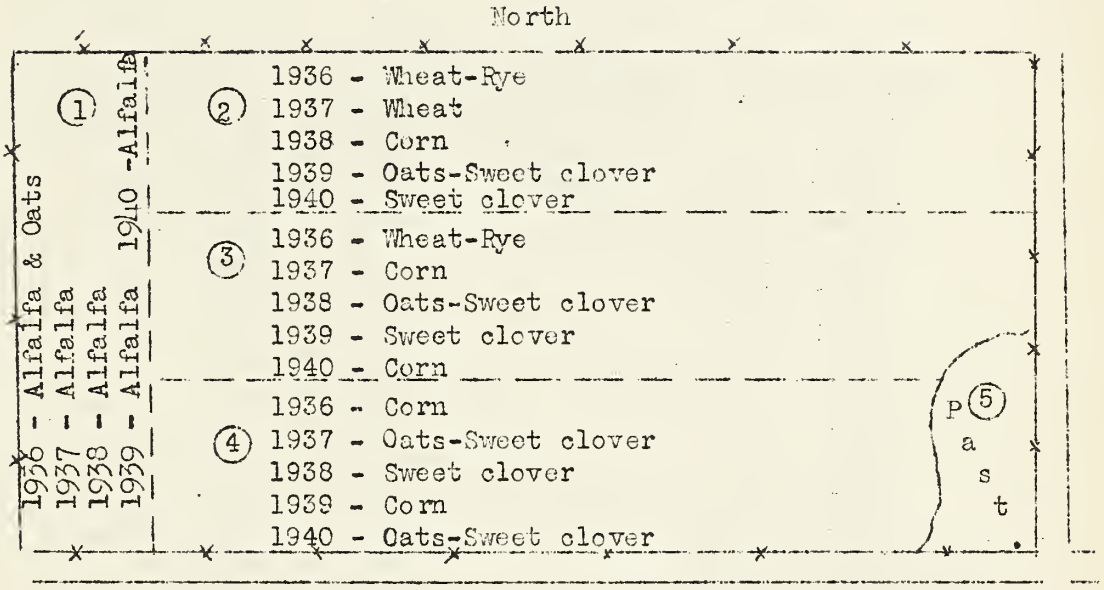
A farm base of 160 acres which has a real problem of soil erosion control. A grass strip 3 rods wide between each field which will be used for seed and hay in years to come, as well as a buffer crop between fields to act as a permanent soil holding factor.

A 2 rod strip around the field gives additional protection against soil movement, holds down weed growth and gives additional seed or hay.

This makes a cropping base of 125 acres. The 1936 cash or grain crop acreages will be 107 acres. The 1936 soil improving crop will be 18 acres in the regular rotation and 26 acres in the buffer strips.

PLANNED FARM

No. 3



This plan represents a badly depleted 80 acres which will go through a period of intensive soil improvement, carrying with it a small cash crop each year with options of alfalfa and sweet clover for feed, seed or both.

PLANNED FARM

No. 4

North

(1)	1936 - Oats-Grass or Alfalfa	1939 - Grass or Alfalfa
	1937 - Grass or Alfalfa	1940 - Wheat
	1938 - Grass or Alfalfa	1941 - Fallow - Corn
(2)	1936 - Fallow - Corn	1939 - Grass
	1937 - Oats-Grass	1940 - Grass
	1938 - Grass	1941 - Wheat
(3)	1936 - Wheat	1939 - Grass
	1937 - Fallow - Corn	1940 - Grass
	1938 - Oats-Grass	1941 - Grass
(4)	1936 - Fallow	1939 - Oats-Grass
	1937 - Wheat	1940 - Grass
	1938 - Fallow or Corn	1941 - Grass
(5)	1936 - Wheat	1939 - Fallow - Corn
	1937 - Fallow	1940 - Oats-Grass
	1938 - Wheat	1941 - Grass
(6)	1936 - Fallow	1939 - Wheat
	1937 - Wheat	1940 - Fallow - Corn
	1938 - Fallow	1941 - Oats - Grass
(7)	1936 - Wheat	1939 - Fallow
	1937 - Fallow	1940 - Wheat
	1938 - Wheat	1941 - Fallow - Corn
(8)	1936 - Fallow	1939 - Wheat
	1937 - Wheat	1940 - Fallow
	1938 - Fallow	1941 - Wheat
(9)	1936 - Wheat	1939 - Fallow
	1937 - Fallow	1940 - Wheat
	1938 - Wheat	1941 - Fallow
(10)	1936 - Fallow	1939 - Wheat
	1937 - Wheat	1940 - Fallow
	1938 - Fallow	1941 - Wheat

FARM PLAN

#4

The plan on the adjoining page represents a farm base of 640 acres of cultivated land in the drier small grain areas where summer fallow or row crops are alternated with wheat as the leading cash crop.

Starting with a 1935 base of 300 acres of wheat and 60 acres of corn or other small grain, we have a depleting base of 360 acres.

The 1936 plan calls for:

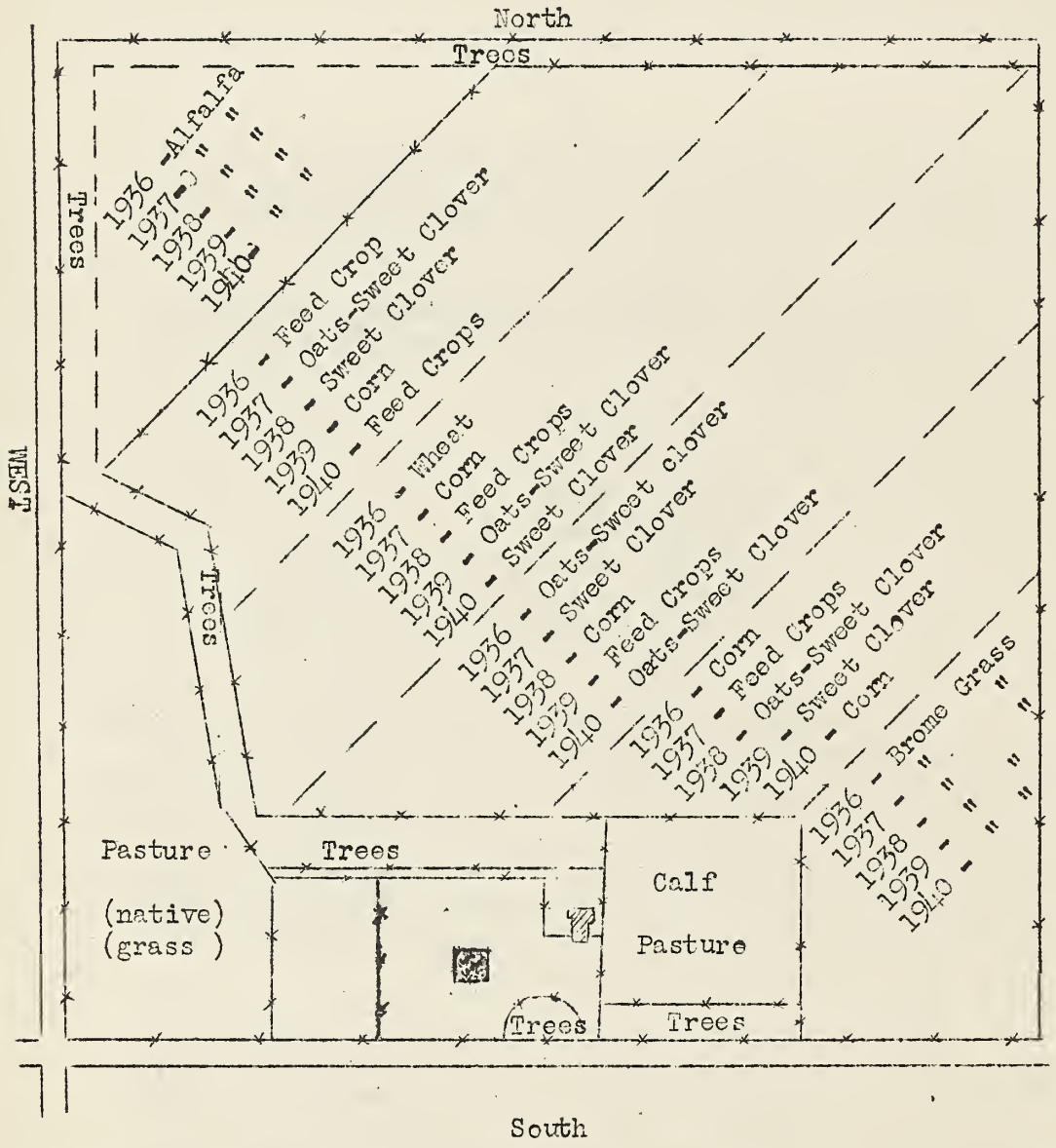
240 acres wheat
60 acres corn
60 acres soil improvement crop
240 acres fallow
40 acres, approximately, in waste land, in roads, turns, etc.

If we consider fallow, moisture conserving, in the drier regions, instead of planting all 60 acres of oats to wheat grass each year in the rotation, if 30 acres were planted and the other 30 acres turned under as green manure, a very satisfactory soil improvement program could be carried out, with a small reduction in wheat acreage, and a much more balanced year to year yield could be anticipated. This would mean 3 years out of 20 would be in grass and once each 20 years a green manure crop would be plowed under.

A 20 year rotation including 30 acres of new grass seeded each year, will increase the wheat acreage 30 acres per year. In regions where corn is being grown extensively a rather large acreage of wheat and corn works in with the fallow, legumes and grasses for a complete soil improving program on a long time basis. Such a plan will call for livestock to consume the available feed and will produce a balanced farm business.

PLANNED FARM

No. 5



This 160 acre farm plan represents extreme methods in soil erosion control. Where a farm has been badly eroded and an intensive plan has been laid out for soil protection and soil improvement over a period of years, and yet will have fair returns in cash crops.

DEVELOPING THE FARM PLAN

"The farmer is a combination business man, mechanic, naturalist and laborer," says a noted authority on farm managment.

The first and most important classification is that the farmer is a business man. As such he is always ready to adopt on his farm sound and proven practices new to him which will increase his profits. The latest innovation in farm management practices comes under the head of soil erosion control. The government service seeks to assist the farmers in controlling the erosion of the farm by either water or wind.

The organization of this service includes one department whose work is to fit the general erosion control plan to each individual farm. This department is called the Erosion Control Practices or Soil Conservation Department. Its members call upon the farmer in the Demonstration or Camp Area and explain to them the program and the methods of handling the work. If the farmer agrees, after the entire program is explained, that the proposed plan will be a personal benefit to him, and at the same time provide a demonstration in erosion control, the next step is to draw a map of the farm and such changes made as the farmer and the Conservationist think necessary. The arrangment of the fields are changed so that they will be planted at right angles to the prevailing direction of the wind, or in the case of water erosion, planted on the contour or on the terraced lands. The conference of this member of the Soil Conservation Service with the farmer may plan for taking out of cultivation a part of the hitherto cultivated land on the farm and the planting of it into grass, if such a change can be made and at the same time increase the probable farm income.

The farmer and the Soil Conservationist work out a definite crop rotation which includes three definite and well established points. First he must take into consideration the needs of the farmer, planning first for crops that will produce sufficient cash to pay the running expenses of the farm and provide means of paying accumulated debts. In other words, he must have a reasonable amount of farm acreage planted to cash crop. Since another source of revenue on the farm is the livestock enterprises, then in planning the crop rotation care must be taken to provide a sufficient amount of feed for the livestock to be kept and sold to further increase the farm income. The third point that must be observed and planned for is the maintenance of soil fertility. Each of these three points must be taken into consideration in developing this crop rotation which is to be, not only economically

sound, but efficient in controlling the erosion of the farm land. This is no easy task and involves a great amount of study and careful thought. It demands, on the part of the co-operator, a complete confidence in the business ability and technical knowledge of the representative of the service, as well as his own.

Strip farming is suggested on each of the cooperators farms in the wind eroded area in order that the force and sweep of the wind may be broken. This part of the program requires, in most cases, an entire readjustment of thinking and planning of the farmer, since during his entire farm experience he has nearly always thought of his fields as running north and south, and of their containing from 40 to 60, perhaps 100 acres each. Now in order to stop the erosion of his farm by the wind he must use strips not more than 35 rods wide with alternating crops. All this is explained to him by the representative of the Soil Conservation Service with the reason and the logic which backs up the plan.

Again we would refer to our first statement and say that a man who really gets the best out of this kind of a plan must be a thorough business man, else he will not be willing to adopt these new methods and put them into his farm business as an integral part of it. He must also be rather of a missionary in that he is willing to allow his farm to be used as a Demonstration which will show to his neighbors that erosion may be controlled, whether it is caused by wind or water, without seriously handicapping the returns from the farm business. This, perhaps, is the greatest need and the greatest work of the farmer living in the Demonstrational Area.

In brief, then, the Soil Conservationist representing the Soil Conservation Service comes to the farm, lays before the prospective cooperator the plan of the Erosion Control, discusses with him the taking out of cultivation of a certain percentage of his land, the planting of legumes as a means of maintaining his soil fertility and producing feed crops for his stock, and the planting of crops in strips laid off at right angles to the direction of the prevailing winds. He does not, perhaps, urge this cooperator to do all this for the sake of his community only, but also for his sake as a producer on an economic unit which should yield a profit. The Soil Conservationist, in doing this, is simply helping the farm operator to carry out the plans laid down by the best authority on soil fertility and permanent agriculture. This authority says, "Every landowner should adopt his land to a system of farming which is permanent. A system under which the land becomes better rather than poorer. The land owner must think for the land."

I. N. C.

WINNER-DIXON DEMONSTRATION AREA

The Winner-Dixon Soil Conservation demonstration area is located in a portion of South Dakota that is characteristic of ecological conditions in a large area of the state west of the Missouri River.

The soil is popularly and commonly called gumbo, but in reality is a very heavy clay having been derived by weathering of the Pierre shale which underlies this clay. Much of this clay soil is low in organic matter content which influences materially tillage practices which must be followed. This soil apparently has a tremendous water holding capacity, but is markedly impervious when once saturated.

Rainfall will average less than 19 inches annually, and under these semi-arid conditions coupled with the tendency for a large proportion of water runoff, the conservation of rainfall should become an important feature in the farming program. Dust storms, both intensive and extensive have occurred in this country and have done much damage. Farming practices should also take into account the prevention of future blowing of this soil.

The following recommendations are limited by the meager available experimental data, and are largely the result of deductions arrived at through a study of the methods employed by farmers and of the prevailing ecological and physical factors. All recommendations must also be governed by available tillage implements and by conditions existing on farms in this area.

1. For emergency control on barren, blowing land.

Barren land should be listed solid and a row crop seeded in the listed furrows, or a small grain crop may be broadcast, then listed allowing the small grain to establish itself on the ridges. Any work of this kind should be on the contour, or level. If the area is not too large, and if there is a scattering of vegetation, then the field may safely be strip listed, being careful to have a good lister furrow every 16 feet and not in any case to exceed 20 feet. Some kind of seed should be planted in the furrows. These furrows should either be placed on the contour or at right angles to the prevailing winds.

Cropping should be done in strips varying from 10 to 25 rods in width placed on the contour if the topography of the farm will allow or at right angles to prevailing winds.

3. Rotation to be used on strips.

A five year rotation of row crops, small grain, row crop, small grain and sweet clover, and second year sweet clover, or a six year rotation identical to the five year rotation listed above followed by one year of rye or winter wheat is recommended.

4. Proper use of crop residue.

It is recommended that no crop residue be turned under or disced up until it is evident that sufficient moisture is present to germinate the following crop. It is recommended that all stubble be cut high, and in the case of stalk fields that strips of stalks be allowed to stand at regular intervals to break the wind and serve as a snow trap.

5. Summer fallowing.

Summer fallowing should be done only in narrow strips not exceeding 20 rods and should be on the contour to retain water, or at right angles to prevailing winds. Stubble or other crop residue should be left standing on the field over winter, to catch snow, and should be listed deep in late April or early May. It should not again be disturbed until weeds make their appearance. All subsequent tillage should be done with an implement that will leave the soil ridged and rough.

6. It is recommended that all pastures on slopes be contour furrowed.

7. Seeding the legumes and grass seed.

Seeding of this nature should be done with a drill, and care taken not to cover the seed too deeply. It is advisable to use a very light seeding of oats, barley, or flax for a nurse crop.

8. It is recommended that intermittent drainage channels now filled with blowing soil be seeded immediately to grass. Western wheat grass, or salt grass as it is commonly called, or brome grass are recommended for this purpose.

L. M. S.

GOING UP IN SMOKE

There are still farms in the northern Great Plains on which straw, stalks, and stubble are being burned in spite of the fact that we should have learned long ago that such a practice is wasteful and destructive.

These so-called "waste" materials, when plowed under, are the chief means of maintaining the soil organic material, loss of which reduces the absorptive and water-holding power of the soil while allowing the soil to break down into small granules or separate grains easily moved by wind or running water, thus making soil erosion easy. Continuation of this practice will add to the millions of acres of once good land already ruined.

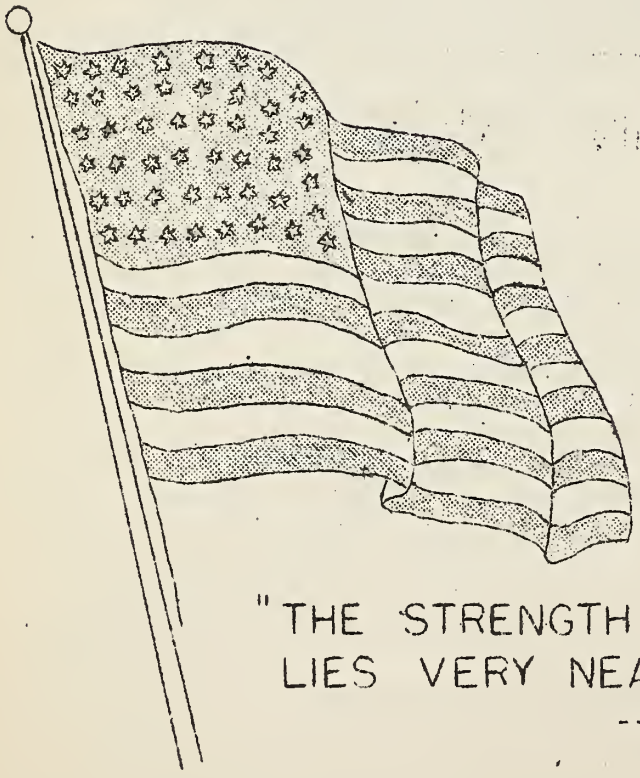
No soil conservation program can be permanently effective unless it provides for the maintenance of the organic matter supply in the soil.

Question: - Has your farm been going up in smoke?

J. G. H.

UNITED STATES
Department of Agriculture
Soil Conservation Service
A. D. Ellison, State Coordinator
Huron, South Dakota

Official Business



"THE STRENGTH OF THE NATION
LIES VERY NEAR THE SOIL"
------DANIEL WEBSTER